PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 50907 WO	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/IB2002/001228	International filing date *(day/month/year)* 22.04.2002	Priority date *(day/month/year)* --

International Patent Classification (IPC) or national classification and IPC
G10L 19/14

Applicant
Nokia Corporation et al

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of __4__ sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, comprising:

   a. ☒ *(sent to the applicant and to the International Bureau)* a total of __5__ sheets, as follows:

      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s))

      _____ , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

   ☒ Box No. I   Basis of the report

   ☐ Box No. II   Priority

   ☐ Box No. III   Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

   ☐ Box No. IV   Lack of unity of invention

   ☒ Box No. V   Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

   ☐ Box No. VI   Certain documents cited

   ☐ Box No. VII   Certain defects in the international application

   ☐ Box No. VIII   Certain observations on the international application

Date of submission of the demand 16.09.2003	Date of completion of this report 15.07.2004
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88	Authorized officer Åsa Rydenius / JA A Telephone No. +46 8 782 25 00

Form PCT/IPEA/409 (cover sheet) (January 2004)

Box No. I	Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on a translation from the original language into the following language _____ , which is the language of a translation furnished for the purposes of:

   ☐ international search (under Rules 12.3 and 23.1(b))

   ☐ publication of the international application (under Rule 12.4)

   ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

   ☐ the international application as originally filed/furnished

   ☒ the description:

       pages   **1-30** _____ as originally filed/furnished

       pages* _____ received by this Authority on _____

       pages* _____ received by this Authority on _____

   ☒ the claims:

       pages _____ as originally filed/furnished

       pages* _____ as amended (together with any statement) under Article 19

       pages* **1-5** _____ received by this Authority on **21.05.2004** _____

       pages* _____ received by this Authority on _____

   ☒ the drawings:

       pages   **1-6** _____ as originally filed/furnished

       pages* _____ received by this Authority on _____

       pages* _____ received by this Authority on _____

   ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

   ☐ the description, pages _____

   ☐ the claims, Nos. _____

   ☐ the drawings, sheets/figs _____

   ☐ the sequence listing *(specify):* _____

   ☐ any table(s) related to the sequence listing *(specify):* _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

   ☐ the description, pages _____

   ☐ the claims, Nos. _____

   ☐ the drawings, sheets/figs _____

   ☐ the sequence listing *(specify):* _____

   ☐ any table(s) related to the sequence listing *(specify):* _____

*   *If item 4 applies, some or all of those sheets may be marked "superseded."*

Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-27		YES
	Claims			NO
Inventive step (IS)	Claims	1-27		YES
	Claims			NO
Industrial applicability (IA)	Claims	1-27		YES
	Claims			NO

2. Citations and explanations (Rule 70.7)

Documents cited in the International Search Report:
D1: "A hybrid coder based on a new phase model for synchronization between harmonic and waveform coded segments" (Katugampala et al 2001)
D2: WO9910719 A1

The cited documents represent the general state of the art.
The invention defined in claims 1-27 is not disclosed by any of these documents.
The cited prior art does not give any indication that would lead a person skilled in the art to the claimed methods of providing phase-characterizing parameters from frames coded according to waveform matching speech coding to be used in order to prevent misalignments between frames coded according to waveform matching speech coding and parametric speech coding, and detection of transition misalignments in transition from frames coded according to waveform matching speech coding and parametric speech coding respectively.
The methods differ from what is previously known from D1 in that (citing from applicants reply to WO): "the present invention relates to transients between frames coded by a waveform coder and a parametric coder. To get the phase value in the first parametric frame, the estimated pitch pulse value in the waveform frame is exploited to ensure smooth transition. Consequently the synchrony between the original and coded speech needs not to be remained, which is asserted as a basic concept of the teaching in accordance with D1. The present invention reflects the requirement to guarantee a smooth transition between succeeding frames coded by waveform speech coding and parametric speech coding. How to handle this specific and very crucial transition in terms of quality is

.../...

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box V

not discussed in D1 since the teaching thereof concentrates merely on the problem of phase continuation between the voiced frames."

Therefore, the claimed invention is not obvious to a person skilled in the art.
Accordingly, the invention defined in claims 1-27 is novel and is considered to involve an inventive step. The invention is industrially applicable.

However, it is recommended that the independent claims are revised in order to more clearly describe the essential features of the invention in order not to be confused with what is previously known from for example D1. (Article 6, Rule 6.3 PCT)
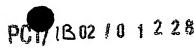
New Claims

1. Method for providing at least one phase-characterizing parameter for speech processing operable with hybrid speech coders and hybrid speech decoders, comprising:

    - obtaining characteristics of a preceding frame coded according to a waveform matching speech coding; said preceding frame according to said waveform matching speech coding being immediately preceding in time to a succeeding frame according to a parametric speech coding

    characterized by

    - deriving said at least one phase-characterizing parameter for processing said succeeding frame according to said parametric speech coding from said obtained characteristics;

    wherein said at least one phase-characterizing parameter is employable to prevent a misalignment of said frames.

2. Method according to claim 1, wherein said speech processing is a speech encoding operation.

3. Method according to claim 1, wherein said speech processing is a speech decoding operation.

4. Method according anyone of the preceding claims, wherein said step of obtaining characteristics of said preceding frame according to said waveform matching speech coding comprises:

    - determining positions of at least one pulse of said preceding frame according to said waveform matching speech coding; and

    - determining a position of a last pulse of said at least one pulse.

5. Method according to claim 4, wherein said at least one pulse is at least one pitch pulse.

6. Method according to claim 4 or claim 5, wherein said step of obtaining characteristics of said preceding frame according to a waveform matching speech coding comprises:

    - determining a pulse value from the distances between said at least two pulses.

7. Method according to claim 4 or claim 5, wherein said obtaining characteristics of said preceding frame according to a waveform matching speech coding comprises:

    - obtaining a pulse value from an antecedent frame.

AMENDED SHEET

8. Method according to claim 6 or claim 7, wherein said at least one phase-characterizing parameter is obtained from said position of said last pulse relative to a size of said preceding frame according to said waveform matching speech coding in relation to said pulse value.

9. Method according to. anyone of the preceding claims, wherein said at least one phase-characterizing parameter is at least one phase value.

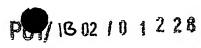10. Method according to anyone of the claims 2 to 9, wherein said determining of said positions comprises:
   - determining average energy values from said preceding frame according to said waveform matching speech coding and
   - evaluating said average energy values in order to determine positions of at least one local maximal energy value and
   - assigning said positions of said at least one local maximal energy value to said positions of said at least one pulse.

11. Method according to claim 10, wherein said determining said average energy values comprises the step of:
   - employing a sliding average algorithm in order to determine said average energy values.

12. Method for detecting a transition misalignment in transition from a preceding frame according to a waveform matching speech coding to a succeeding frame according to a parametric speech coding, said preceding frame according to said waveform matching speech coding being immediately preceding in time to said succeeding frame according to said parametric speech coding, comprising:
   - obtaining characteristics of said preceding frame according to said waveform matching speech coding,
   - obtaining characteristics of said succeeding frame according to said parametric speech coding, and
   - evaluating said obtained characteristics in order to detect said transition misalignment.

13. Method according to claim 12, wherein said obtaining characteristics of said preceding frame according to said waveform matching speech coding comprises:
   - determining positions of at least one pulse from said preceding frame according to said waveform matching speech coding and
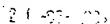   - determining a position of a last pulse of said at least one pulse,

and wherein said obtaining characteristics of said succeeding frame according to said parametric speech coding comprises:

- determining positions of at least one pulse from said succeedingframe according to said parametric speech coding and

5 - determining a position of a first pulse of said at least one pulse,

14. Method according to claim 13, wherein said pulses are pitch pulses.

15. Method according to claim 13 or claim 14, wherein said evaluating said obtained information

10 comprises:

- determining a distance of said position of said last pulse and said position of said first pulse and

- comparing said distance with a pulse value.

15 16. Method according to claim 15, wherein said pulse is obtained by the step of:

- determining said pulse value from distances of said pulses included in said preceding frame according to said waveform matching speech coding.

17. Method according to claim 15, wherein said pulse is obtained by the step of:

20 - determining said pulse value from a phase contour of an antecedent frame according to said parametric speech coding.

18. Method according to anyone of the claims 12 to 17, wherein said determining of said positions comprises:

25 - determining average energy values from said frame and

- evaluating said average energy values in order to determine positions of at least one local maximal energy value and

- assigning said positions of said at least one local maximal energy value to said positions of said at least one pulse.

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19. Software tool for speech processing, comprising program code portions for carrying out the operations of any one of claims 1 to 18, when said program is implemented in a computer program for executing on a computer, a user terminal or a network device.

35 20. Computer program for speech processing, comprising program code section for carrying out the operations of any one of claims 1 to 18, when said program is run on a computer, a user terminal or a network device.

21. Computer program product for speech processing, wherein said computer program product is comprising program code sections stored on a computer readable medium for carrying out the method of any one of claims 1 to 18, when said program product is run on a computer, a user terminal or network device.

22. Communication terminal device offering enhanced quality of transmitted speech data comprising a speech encoder including a parametric speech encoding unit, a waveform matching speech encoding unit, and a communication interface for communicating speech encoded data via a mobile communication network, wherein said speech encoder is able to operate the method for providing at least one phase-characterizing parameter for coding a succeeding frame according to a parametric speech coding according to anyone of the claims 1 to 11.

23. Communication terminal device offering enhanced quality of transmitted speech data comprising a speech decoder including a parametric speech decoding unit and a waveform matching speech decoding unit and a communication interface for communicating speech encoded data via a mobile communication network, wherein said speech decoder is able to operate the method for detecting a transition misalignment in transition from a preceding frame according to a waveform matching speech coding to a succeeding frame according to a parametric speech coding according to anyone of the claims 12 to 18.

24. Terminal device according to claim 23, said speech decoder being additionally able to operate the method for providing at least one phase-characterizing parameter for coding a succeeding frame according to a parametric speech coding according to anyone of the claims 1 to 11.

25. Network device offering enhanced quality of transmitted speech data comprising a communication interface for receiving encoded speech data and transmitting encoded speech data and an analyzing unit, said analyzing unit being able to operate the method for detecting a transition misalignment from a preceding frame according to a waveform matching speech coding to a succeeding frame according to a parametric speech coding according to anyone of the claims 12 to 18.

26. Network device according to claim 22, said analyzing unit being additionally able to operate the method for providing at least one phase-characterizing parameter for coding a succeeding frame according to a parametric speech coding according to anyone of the claims 1 to 11.

27. System offering enhanced quality of transmitted speech data comprising:

  - a first terminal comprising a speech encoder for encoding speech and a communication interface for transmitting encoded speech data,
  - a first terminal comprising a speech decoder for decoding said encoded speech data and a communication interface for receiving said encoded speech data,
  - an intermediate network device offering enhanced quality of transmitted speech data according the anyone of the claims 25 to 26.